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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/627,418 07/27/00 USAMI

T 00N010-US

EXAMINER

MM71/0814

MCGINN & GIBB PC
1701 CLARENDON BOULEVARD SUITE 100
ARLINGTON VA 22209

QUACH, T

ART UNIT

PAPER NUMBER

2814

DATE MAILED:

08/14/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trad marks

Office Action Summary

Application No.

09/627,418

Applicant(s)

USAMI, TATSUYA

Examiner

Tuan Quach

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 July 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) 6-13 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

- 15) ☒ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 18) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other: _____

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DETAILED ACTION

The file record indicates that an IDS was filed on July 27, 2000 but the copy was missing from the file. Applicant is requested to refile such IDS for consideration.

Claims 1-5 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 3 lines 2-4, the phrase "between one of said plurality . . ." is stated twice; it appears that one of which is redundant. In claims 4 and 5 "said adhesion layer" is inconsistent with "adhesion layers" in claim 3 lines 1-2.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lopatin et al.

Lopatin et al. teach copper 24 and low dielectric constant layer, e.g., layer 30 including HSQ material thus possessing the property that Cu is unlikely to enter it since the same material is employed. The provision of via in low dielectric constant 50 followed by barrier layer 54 and copper 58 is also taught. See column 6 line 4 to column 7 line 21. Although Lopatin et al. do not explicitly recite the Cu concentration to be equal or higher than 10^{19} atoms/cm³, such would have been encompassed in Lopatin et al. since the concentration therein is not required or limited to be below the said value, and since

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the optimization of such concentration to obtain a desired conductivity would have been obvious to one skilled in the art.

Claims 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lopatin et al. as applied to claims 1 and 2 above, and further in view of Zhao et al.

Lopatin et al. as applied above show also the barrier but do not recite the adhesion language, the use of tungsten and the same etching rate.

Zhao et al. teach various the conventional use of liner in conjunction with copper wherein the barrier also provides adhesion, including the use of tungsten for such material. See column 4 lines 52 to column 5 line 25. -63. The provision of openings 24 and 25 in various low dielectric constant material, e.g., layer 14, followed by copper conductor, e.g., 29 including barrier/adhesion is also shown. See column 6 lines 10 to column 8 line 45.

It would have been obvious to one skilled in the art at the time the invention was made in practicing the above invention to have included the tungsten barrier/adhesion layer in question to improve adhesion/barrier characteristic in the copper interconnect. The selection of the same etching rate would have been obvious and would have been within the purview of one skilled in the art to facilitate the removal of the wiring line and the adhesion/barrier layer.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Ting et al., Stamper, Subramanian et al., Shimizu et al., and Grill et al. are cited teaching multilevel interconnects of interest.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Quach whose telephone number is 703-308-1096. The examiner can normally be reached on M-F from 9 to 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri, can be reached on (703) 306-2794. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.



Tuan Quach
Primary Examiner